Missions for America
Semper vigilans!
Semper volans!

The Coastwatcher

Publication of the Thames River Composite Squadron
Connecticut Wing
Civil Air Patrol

300 Tower Rd., Groton, CT
http://ct075.org.

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Vol. VIII, No. 25 08 July 2014

SCHEDULE OF COMING EVENT

15 JUL-TRCS Meeting
18 JUL, 2014-CTWG Golf Tournament
19 JUL-02 AUG-Nat'l Emergency Services Acad.
22 JUL-TRCS Meeting
29 JUL-TRCS Meeting

08-16 AUG-CTWG Encampment-Camp Niantic
11-15 AUG-ACE Academy II (GON)
23 AUG-Wing Wide SAREX-HFD

09 SEP-TRCS Picnic
20 SEP-Cadet Ball-USCGA (tentative)
01 OCT-CTWG Commander's Call and CAC
17-19 OCT-CTWG/NER Conference
16-18 OCT-NER AEO Course at Conference
18-25 OCT-NER Staff College-New Jersey

CADET MEETING

08 July 2014
submitted by
C/SSgt Virginia Poe

Cadets opened the evening with a formal inspection lead by C/1Lt Tynan and C/SMSgt Meers.

Cadets followed inspection by drilling at Groton New London Airport.

C/CMSgt Johnstone discussed promotion requirements with new cadets.

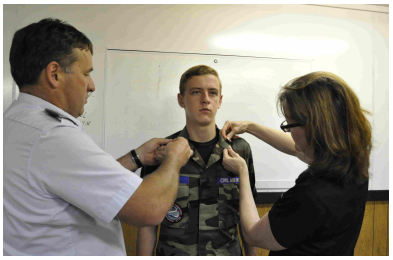
An aerospace activity was lead by C/CMSgt Trotochaud. Cadets were presented a list of materials and asked to decide which of them would be most useful on the lunar surface.

Cadets Aubrey Crandall and Matthew Carasone were promoted to Cadet Airman, Cadets Virginia Poe and Austin Eichelburg were promoted to Cadet Technical Sergeant, and Cadet John Meers was promoted to Cadet Senior Master Sergeant. C/CMSgt Johnstone received his First Sergeant insignia from C/1Lt Tynan.

Cadets Crandall and Carasone are the newest C/Airmen in TRCS

Cadet Eichelberg reports for promotion to C/TSgt.

Maj Noniewicz and Mrs Meers pin C/SMSgt insignia on Cadet Meers



SENIOR MEETING

08 July, 2014
Submitted by
Capt. Eliot White Springs

Commander's Call

Maj Paul Noniewicz, TRCS Squadron Commander, presented the monthly safety briefing on operational risk management.

Maj Roy Bourque will be in charge of the annual station maintenance field day which will be scheduled in October.

Maj Willi Linelmann, Finance Officer reported that the treasury has about $11.5K, the mortgage will be paid off this year, and senior member dues, $50, should be paid within a month.

Maj Lintelmann also reported that the new CTWG Communications Officer, Lt Jenkins of the 399th, has aggressively attacked some of our chronic problems and is working to remedy them.

SM Jeffrey Stone reported that Quonset now has an Army and Air Force Exchange Service (AAFES) which carry Air Force uniform items. The store is open until 1800 on drill weekends, 1400 otherwise.

Emergency Service Officer Maj Scott Farley asked members about attendance at the CTWG SAREX on 23 August in Hartford.

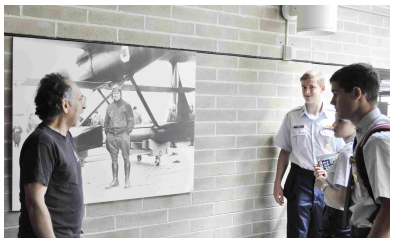
Logistics Officer Lt Sonia Simpson reported that we have a good supply of blue uniforms but are very short of BDUs.

LtCol Lawrence Kinch reported that a new cadet protection protocol has been formulated and all members must complete the program by March of 2015.

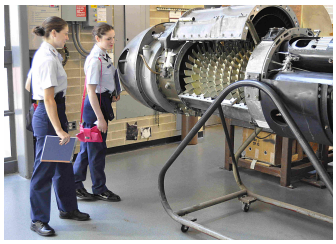
MIT/USS CONSTITUTION FIELD TRIP

Cadets Keith Trotochaud, John Meers, Virginia Poe, and Aubrey Crandall met Maj Roy Bourque and LtCol Rocketto at 0645 on Wednesday, the 9th of July and departed in the Squadron Van for a day in Cambridge and Charlestown, Massachusetts.

Their first stop was at the Massachussetts Institute of Technology's Guggenheim Aeronautical Laboratory. MIT's Mr. William Litant met them and conducted them on a tour of some of the facility. After a briefing on the history of aeronautical and astronautical engineering at Tech, the stopped in the "hangar" and viewed a number of notable turbine engines: a General Electric centrifugal flow J-31 used in the first US jet, the Bell P-51, a Junkers Jumo 004 axial flow engine used on the Messerschmidt Me-262, the first operational jet fighter, and a modern CFM 56-3C by-pass turbine.



Mr. Litant points out Jimmy Doolittle, MIT's first Ph.D. in Aero.

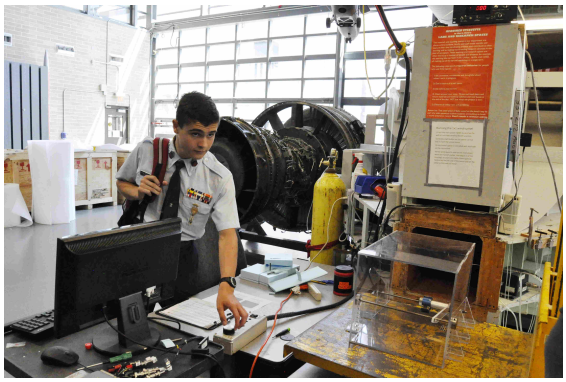


Cadets Crandall and Poe inspect an axial flow turbine.

They were also shown a number of UAVs designed by MIT students and examined Prof, Mark Drela's man-powered hydrofoil, on of which holds the record for the fastest man-powered watercraft.

Cadet Poe and Trotochaud view the "cabin" of one of Drela's pedal powered hydrofoils.

The last item viewed was the 1X1 wind tunnel, a small unit which is open to student use. One of the more interesting items studied were models of Boston building. The models were used to determine the effect of nearby structures on the wind loads which might be encountered.



Trotochaud energizes the small wind tunnel.

The group then moved to the control room of the Wright Brothers Wind Tunnel. The subsonic device has been operational since 1938. The tunnel was currently in use and studying the stability of a Humvee in suspension, as might occur when one was being transported as a sling load by a helicopter.

The control board for the Wright Wind Tunnel. Closed circuit TV allows real-time visual monitoring of the behavior of the test object, a model of a Humvee.

The next stop was at the turbine facility in the Sloan Laboratory. Since it was summer, there was little research activity but lots of fascinating equipment was on view.

Lunch was taken at the Lobdell Food Court in the Stratton Student Center. LtCol Rocketto was disappointed when four of the party chose *Subway* grinders. Although *Subway* is a Connecticut company, Rocketto thought the choices pedestrian . He commends Cadet Poe for selecting beef teriyaki while he supped on chicken curry, dahl, and naan.

Lunch was followed by a visit to the Hart Maritime Museum at MIT's Pratt School of Naval Architecture. Cadets and officers admired the exquisite models on display and noted the historical importance of many of the vessels portrayed.

Cadets Poe and Trotochaud view three ships which encapsulate much of the history of mechanically powered vessels. From left to right: S.Y Turbinia, the first turbine powered ship, M.V. Sealandia, the first practical diesel powered ship, and steamer S.S. Eastern Crown, fueled by coal.

Ship models are OK but real ships are better so the group headed the van east to Charlestown and the old Boston Naval Shipyard, now a National Park Historic Site and the home of "Old Ironsides," the *USS Constitution*, oldest warship still afloat and a commissioned naval vessel.

The *Constitution,* rated a 44 gun frigate, is the only survivor of the six frigates authorized by Congress in the Naval Act of 1794. She is manned by a select crew of US Navy active duty sailors who not only carry out the normal shipboard duties but also provide excellent lectures about the construction and history of the ship.

Our lady cadets model traditional 18th century sailor garb. *(Photo by Maj Roy Bourque)*

The complex details of the rigging, masts, and spars could be closely examined and their interrelationships noted. Armament was prominent. The spar deck housed the battery of the short barreled carronades which fired a 32 pound ball. The gun deck was fitted out with 24 pound long guns which had a longer range than the carronades.

Cadet Meers said that the 28 pound carronades on the weather deck and the 32 pound "great guns" on the gun deck fascinating. *(Photo by Bourque)*

Cadet Crandall inspects the ship's bell. She found the naval architecture and ship artifacts one of the most interesting parts of the visit.

The nearby museum housed a collection artifacts and exhibits which illustrated many of the details of 18th and early 19th century naval history from rope making to food to ship construction.

As a bonus, we were also able to go aboard the USS Cassin Young (DD-793), a World War II Fletcher Class destroyer. Only the weather deck was open to visitors whereas two decks were open on the Constitution. Nonetheless, we got to view the interior of a 5 inch/38 caliber turret, officers wardroom, sickbay, combat information center, and stand-by radio room as well as the hedgehog battery, torpedo tubes, and depth charge racks.

Upon departure, the cadets were given copies of Oliver Wendell Holmes poem, *Old Ironsides*, and a copy of Rocketto's recently published monograph on contributions of MIT to aeronautical engineering.

Maj Borque is commended for his expert handling of our van in the melee which passes for road traffic in Boston. We returned to Groton at 1900, completing a 12 hour field trip filled

AEROSPACE CURRENT EVENTS

Derailment Dumps Six 737s Onto Riverbank

The accident dumped two of the 737 fuselages into the river, leaving them partially submerged in

water, while another came to rest on the river embankment just above the water's surface. A fourth 737 fuselage that was damaged sat beside the tracks.

Three of the 737 fuselages are visible, one on the bank and two partially submerged. *(Photo Credit: AP Photo / Wiley E. Waters Whitewater Rafting, Brock Sarbeck)*

Operations are underway to get the fuselages back on railroad cars and get them to Washington were the damage can be assessed.

NY Police Chopper Encounters Drones over Washington Bridge

A New York Police Department helicopter flying at 2,000 ft. claim they had to maneuver to avoid two drones which the encountered over the George Washington Bridge. The helicopter then tailed the drones and when they landed near Fort Tryon Park, called ground patrolmen to the scene where the two operators were arrested.

One of the operators claimed later that "The copter came to us." They were both charged with felony reckless endangerment and released without bail.

AEROSPACE HISTORY

A Short History of Aerial Photography
by
Stephen M. Rocketto

Part Five
(1975-Today)

T*he Advent of Satellites*

The military use of aircraft for strategic and tactical photography continued unabated after the U.S. withdrawal from Vietnam. The aircraft were supplemented by the satellite programs starting with Corona which used film which had to be recovered. The Corona series used an Itek 24 inch focal length camera and recorded imagery on 70 mm film. The exposed film was stored in canisters which could be ejected to re-enter the atmosphere where they deployed a parachute and were recovered in mid-air by a specially equipped aircraft, a C-119J or JC-130B or naval vessels if they reached the surface. These early satellites has a resolution of around six feet. The latest satellites can transmit the imagery in near and real time and the best resolution runs around six inches. The obvious advantage of electronic transmission of images is that the life-time of the satellite is not limited by the film supply or the number of re-entry canisters.

However, the satellites have some drawbacks. First, they are in relatively fixed orbits and predictable so that a nation can camouflage, hide, or cease activities of interest when within view of a satellite. The satellite orbits can be adjusted but this takes time and uses fuel which in turn, limits a satellites useful life.

Post Vietnam Use of The U-2 and SR-71

On the other hand, the U-2, A-12, and SR-71 aircraft are far more flexible and could be tasked to cover a point of interest or an event within hours. From the end of the Vietnam War to today, these aircraft were employed repeatedly by the CIA and USAF. Neither the A-12 nor the SR-71 were ever used for overflights of the Soviet Union. That dangerous job was taken over by the satellites.

The CIA's A-12 saw all of their operational service over Vietnam, China, and North Korea between May of 1967 and May of 1968. The reasons for its retirement involved expense, utility, and the turf fight for missions between the USAF and the CIA. The expense was high and the USAF resented its share of the cost in supporting the aerial tanker fleet and the ground stations. The SR-71, with less flight performance, could carry more sensors,

especially ELINT instrumentation. In the end, the entire fleet of A-12s was placed in storage or on display.

The SR-71 enjoyed a production run of 32 aircraft, about twice the number of A-12s. The first SR-71 mission was flown in March of 1968, about a year after the A-12s debut. Their primary areas of operation were Southeast Asia and the periphery of the Soviet Union over the Baltic Sea. Eventually budgetary problems also grounded the SR-71 fleet. Its high cost of operation siphoned money away from other projects which deeply interested the Air Force, especially the development of the B-1 and B-2 bombers and the Global Hawk UAV. The last operational sortie was flown in 1989, capping just over two decades of service by the Blackbird.

"Super Drone"

Although the USAF was chary of using the SR-71 for certain overflights, a project code-named "Tagboard" attempted to develop a UAV version of the SR-71. Lockheed produced the D-21, a 43 foot ramjet powered drone designed to be air launched from a modified A-12, re-designated M-12, at Mach three. The D-21used a pre-programmed flight plan and had a range of around 3,000 miles while cruising a an altitude of just under 100,000 feet. At missions end, the film canister would be ejected an subject to mid-air recovery. During the fourth test, the D-21, which was carrried on the back of the M-21, pitched down when launched and destroyed the mothership, causing the death of one of the crew and the end of the M-12 launch concept.

D-21 nestled next to an SR-71A

However, a B-52 was modified to carry two D-21s on underwing pylons and a number of missions were carried out over China. The results were unsatisfactory and B-52 launches were discontinued adnnteh D-21s retired.

Although the glamorous Blackbirds were retired, the stodgy old U-2 carried on in improved versions. The first series of U-2s were mostly A and C models and had a production run of around 50 ships. The are sometimes called the "small wing" airframes with a wingspan of 80 feet.

Interim models had larger engines, increased fuel capacity, and aerial refueling gear. These bore suffix letters, E, F, and H. The -G models were modified for aircraft carrier operations with tail hooks, beefed up landing gear, and folding wings.

Later production runs were the "large wing" airframes with wingspans of 103 feet. These were designated as the U-2R, U-2S, for a time, TR-1A. Tactical reconnaissance U-2s had side looking radar. They could cruise in relative safety along the borders of a nation of interest or a combat zone and take electronic pictures up to 80 miles away.


Large Wing U-2 (Photo Credit: SSgt Brian Ferguson, USAF)

They could be found in almost every theatre where U.S. Troops or allied troops were engaged. During Desert Storm in 1990, the U-2s missions included targeting, locating enemy formations, and bomb damage assessment. In Afghanistan, their ability to spot disturbed earth and their direct radio contact with troops on the ground allow them to warn of possible roadside bombs.

Much of the photography was improved by better lenses, multi-spectral imaging, and computer enhancement techniques. Noteworthy is the far more sophisticated ELINT, COMINT, and SIGINT receivers which either flew on photo ships or were installed in electronic warfare aircraft and satellites.

Unmanned Aerial Vehicles as Reconnaissance Platforms

Large unmanned aerial vehicles such as the Northrop-Grumman RQ-4 Global Hawk compete with the U-2. The RQ-4 is operated by the Air Force, Navy, and NASA. It is a high-altitude, long-endurance (HALE) UAV and can provide near real-time imagery in the optical and infrared wavelengths to military commanders in the field. The aircraft carries a variety of optical and electronic sensors during its usual missions flown at 50,000 feet and was the first pilotless aircraft to cross the Pacific, flying from Edwards AFB to Australia in a 22 hour flight.

Dragon Lady vs. Global Hawk

The plan was to replace the U-2 with the "cheaper to operate" Global Hawk and funding was allocated to determine how to adapt the excellent U-2 senors for the Global Hawk. A performance comparison is interesting.

The U-2 has a clear advantage in operating altitude, about four miles more, which gives it a much further horizon, an advantage if probing another nation from its periphery. It can also get to its operating altitude in about an half hour whereas the RQ-4 takes about four hours. The higher altitude of the U-2 will get it over almost all weather, something not possible in the UAV. On the other hand, the RQ-4s endurance is around three times that of the U-2 which typically flies 10 hour missions.

The Dragon Lady carries a better multi-spectral optical sensor package than the Global Hawk which has led to efforts to modify the U-2 cameras for the Global Hawk. RQ-4 advocates point out that the UAV carries a greater variety of sensors which are advantageous under certain circumstances.

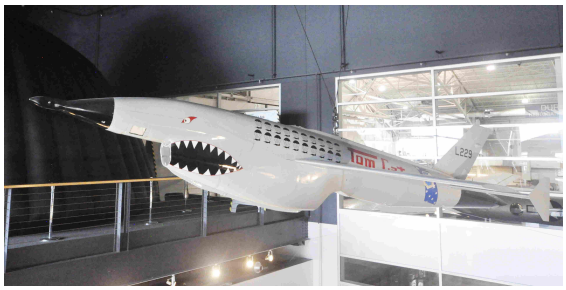
Waiting Global Hawk "eyeballs" two seat U-2 trainer on short final.

Comparing costs is difficult and taxes the imagination of a bean-counter. The U-2s are paid for and amortized whereas the RQ-4s development costs and upgrades are still being paid for by a very cost conscious Congress. Operating costs are hard to compare but there seems to be some agreement that they are more or less equal. Advocates of each of the systems will continue to argue and lobby until the budgetary issue is settled. Both aircraft have seen heavy use over Iraq and Afghanistan as well as utilization by NASA for atmospheric research projects. The jury is out and what happens will be both a technical and a political battle.

UAVs are now heavily employed by the US military. The Duke of Wellington lamented that he had to guess "...what was at the other side of the hill. Military commanders down to the platoon level now have the option of knowing what is there. A wide range of simple, often hand-launched UAVs are available.

AeroVironment produces the quiet, electrically powered RQ-11 Raven. The Raven cruises between 30 and 60 mph and has an endurance of up to 90 minutes. The control is line of sight and limited to about six miles. The sensor package is either and electro-optical color camera for daytime use of an infrared camera for use at night. The newest Ravens are equipped with digital transmitters and can send the data to the user in encrypted format.

Reconnaissance drones are not a new idea. One of the best examples is the Ryan Model 147 Firebee series which was intensively used in Vietnam. They were air-launched from DC-130s and, at the end of a mission, parachuted down and were recovered in mid-air by helicopters. The Chinese reversed engineered one of the Firebees, the AQM-34, using vehicles which has been shot down and recovered. The not only use it but export it as the Wu Zhen 5 Long Rainbow!



QM-34L at the SAC Museum in Nebraska. The Firebee flew low altitude missions and many were equipped with real-time TV transmitters. The display craft is painted as "Tomcat," the all-time record holder with 68 combat sorties before being lost on the 69th.

During the 1970s, Firebees were delivered to Israel and served for around 20 years. The Israeli Firebees were ground launched using rocket assists (RATO) and recovered by helicopters also.

Israel also developed a number of small reconnaissance UAVs during the '70s. The Tadiran Mastiff carried a data-link system allowing live video streaming and is considered to be the first modern battlefield UAV.

A Mastiff is in the front row left. Center is the Zahavan Oriole Scout, a variant on the Mastiff. A Firebee with nine mission marks is visible in the background.

The US firm, AAI and Israel Aerospace Industries formed a joint venture and used the Mastiff as a prototype to develop the RQ-2 Pioneer. The Pioneer has been used by the Navy, Marines, Israel, and Singapore. It is powered by a small two cycle engine of generating just over 25 horsepower and can take off under its own power, or launched by a catapult. The Navy used the as artillery spotters and the Marine Corps uses the for reconnaissance and surveillance. The RQ-2 carries thermal imaging equipment, color optics, and near infrared sensors.

RQ-2B at USMC Flying Leatherneck Museum, Miramar, California

The future of UAV photo-intelligence aircraft is unlimited. Current prototypes range from micro vehicles on the scale of insects to helicopters to very large, high flying ships powered by electricity and recharged by sunlight.

The Versatile C-135

The ubiquitous Boeing C-135 has oft been modified for photographic purposes. A "Cobra" prefix on a mission or equipment generally indicates that it has something to do with collecting technical intelligence on long range missile tests. The USAF flies the RC-135S, Cobra Ball, equipped with specialized cameras and ferret gear for this mission. When a Russian missile test is imminent, the aircraft is stationed over the North Pacific and oriented in the proper direction. The re-entering warhead and rocket fragments can be photographed and analysts can estimate the physical properties of the missile and its payload.

Cobra Ball in flight. The camera ports are mounted on the starboard side of the fuselage. Note the starboard wing and engines painted a non-reflective black to prevent flare on the imagery. *(USAF Photo)*

On 01 September, 1983, a Korean Airlines 747, KAL 007, was destroyed by Su-15 interceptors off the coast of Sakhalin Island. The flight had deviated from its planned route, probably due to pilot mistakes entering coordinates into its inertial navigation computers. Some maintain that the Russian defense force mistook the 747 for a USAF RC-135 that was believed to have been in the same area.

Some Foreign Aerial Reconnaissance Efforts

Soviet aerial photo-intelligence efforts agains the United States were never pressed with the same intensity of US efforts over Russia. There was no need. Open source material was available in any library or from the US Government Printing Office.

The state run Aeroflot Airlines was suspected of engaging in aerial espionage. Off-course Il-62s on the Moscow-Washington route have been know to fly over important installations such as SAC bases and Groton's Submarine Base and Electric Boat's submarine yards.

An Aeroflot Ilyushin Il-62

The Soviet Air Forcce Tu-95 Bears regularly cruised down the US east coast on the way to Cuba and back and undoubtedly engaged in ferret activity. US navy ships were regularly shadowed and in one case, a Tu-16 Badger crashed after it made a low pass over the USS Essex.

US Navy photo of the Badger-F just before it crashed.

The Israelis operated and still operate a robust photo-intelligence operation over their encircling enemies. Over time, they used a number of aircraft such as the Gloster Meteor, the Boeing C-97, the Dassault Mirage, IAI Kfir, and the McDonnell Phantom II.

From the top, a Gloster FR.9 Meteor, a IAI RC-2 Kfir, and a McDonnell RF-4E.

In turn, the Egyptians used the photo-reconnaissance version of the Foxbat, a MIG-25RU flown by Russian pilots to overfly and image Israeli territory. The Israelis repeatedly failed to stop the Mach 2.5+ Foxbats which cruised at 70,000 feet.

Scientific Research

Scientific research has been well served by aero photography. NASA flies its version of the U-2, the ER-2 for studies of phenomena such as weather and forest fires. Wild-Heerburg, Hycon, and Itek cameras allow for a wide range of options and can be carried in the Q-bay or on wing pods. Missions might be overflying hurricanes in order to photograph the cloud patterns or ground surveys of crops or erosion. The highest resolution obtainable is around an inch at the nadir from 65,000 feet.

ER-2 at NASA's Wallops Island Station

The National Oceanic and Atmospheric Administrations maintains a fleet of aircraft which include two set up for aerial photos, a DHC-6 Twin Otter and a Beechcraft King Air 350. The Twin Otter has two camera ports in the floor and bubble observer windows to allow vertical viewing. The Beech has a forward and rear port and carries an Applanix digital camera system which can be configured for mapping and hyper-spectral imaging.

The ventral camera hatches are not visible in NOAA's Twin Otter but the bubble observer windows may be seen forward and aft of the wing.

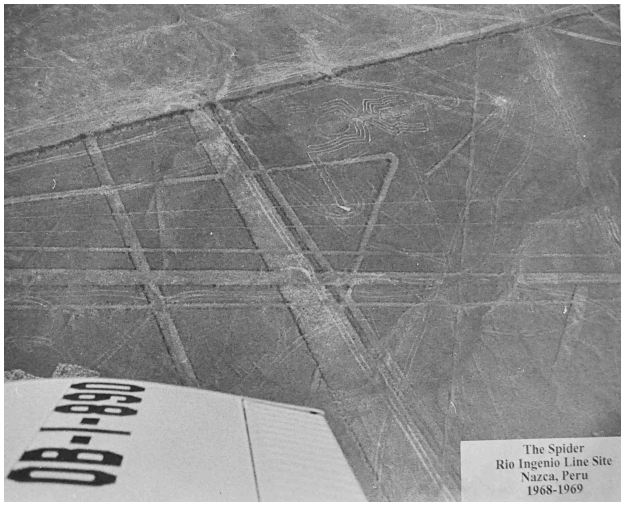
NASA once operated a Convair 990, the Galileo Galilei. The author was involved in the engineering of camera mounts for low light level, high speed imaging systems designed to photograph a barium ion cloud released in the magnetosphere. The aircraft was a back-up to ground stations in case of cloud cover. On the night on which the rocket carrying the payload was launched, the aircraft had engine problems and could not take off. Fortunately, there was no cloud cover at the base at Wallops Island, Virginia so the aircraft was taxied into position so that the cameras would point at the right area of the sky. Successful photographs were acquired. Given the cost of flying the aircraft from Edwards to Virginia and the cost of the modifications, this may have been the most expensive camera tripod in history.

NASA also operates a Boeing 747SP in cooperation with the German Aerospace Center as a **S**tratospheric **O**bservatory **f**or **I**nfrared **A**stronomy (SOFIA). The instrument is a 34,000 pound telescope with an eight foot mirror. At altitude, the aircraft is above about 99.8% of the water vapor in the atmosphere and can obtain good imagery of celestial objects in the infrared which is especially useful for studying the genesis of massive stars, the type believed to ultimately distribute the heavier elements which are basic to planet formation.

747SP With Open Telescope Hatch (Photo Credit: German Aerospace Center)

Archeological sites are often imaged. Sometimes, the faint outlines cannot be seen from the surface and aerial photography reveals are useful not only for discovery but for inspection of details. The author used a Piper PA-28-180 Cherokee and a hand-held Honeywell Spotmatic to take pictures of linear constructs and pictographs on the Pampa Ingenio near Nazca, Peru. Sponsored by the

National Geographic Society and the Smithsonian Astrophysical Observatory, the study was an attempt to determine if the ancient site might have been used as an astronomical observatory. The mission required steep banks at low altitude and required some sporty flying. Early morning was chosen to both enhance shadow angles for good contrast and to avoid turbulence generated by a a hot desert floor.



Near IR image of part of the Nazca line field and the "Spider." the Spider is visible in the upper right part of the field.

Commercial Use of Aerial Photography

During the 1970s, Tim Flynn's AeroMarine Surveys operated out of Groton Airport. One contract with an energy company required overflights of urban areas. Infrared photographs were taken and used to determine the efficiency of the insulation in housing. The energy company could then contact customers with inefficient insulation and suggest remedies.

Aeromarine Surveys also carried Department of the Interior biologists on off-shore missions tracking whales, and developed buoys for tracking currents.

Aeromarine Surveys flew this Beech AT-11 Kansan with a bombardier nose and a Cessna 337 Skymaster.

Flynn and two members of his "People's Cookie Collective, Ted Crosby and Abe Rocketto, work on a prototype drift buoy. The buoy is equipped with a strobe, locator beacon and four uniquely colored blades which identify it in the aerial photograph.

Aerial photography is commonly utilized by city planners, the broadcasting industry, agricultural interests, real estate developers, journalists, and the film industry to name just a few of the many practitioners who require a birds-eye view of the world.

This four-part history of some of the facets of aerial photography has only scratched the surface of a most useful discipline. The explosive use of drones and the remarkable imagery obtained by earth orbiting satellites, planetary explorers, and deep space instruments such as the Hubble Space Telescope are subjects reserved for future consideration.